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ABSTRACT

Noting that the existence of learning disabilities after high school is considered problematical, a study determined the presence of learning disabilities among freshmen at Kean College of New Jersey and whether a specific set of learning characteristics exist which interfere with the successful completion of the college curricula. Subjects, 404 high-risk college freshmen, were administered processing, cognitive, and learning styles tests. Results indicated that: (1) 84 students (20.8%) were identified; (2) significant correlation between "failure" and individual measures was found; (3) learning disabled students need to improve their cognitive abilities in vocabulary, comprehension, spelling, and arithmetic; (4) intervention in these areas should be made in conjunction with processing adjustments in visual spatial, visual figure-ground, auditory, and visual-motor; and (5) the learning disabled students exhibited no preferred specific learning style, except in the areas of visual numeric and social group. Findings suggest that the screening procedure was successful and should be continued to provide program modifications for the identified students. (Seven tables of data are included. Contains 43 references.) (RS)

Learning disability characteristics of high risk freshmen

by

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ABSTRACT

This was a study of four hundred four high risk freshmen who first attended Kean College of New Jersey in Summer 1992 and Summer 1993. A series of tests were administered in the processing and cognitive areas to determine the presence of learning disabilities. Its purpose was to establish attributes of students considered to be learning disabled.

ACKNOWLEDGEMENT

I would like to thank Prof. Robert C. Andrews (Director of Academic Support for Learning Differences at Kean College) for his help in designing this study and also for his guidance in helping me understand and love learning disabilities. And thanks to Dr. Albert J. Mazurkiewicz (Chairperson of the Department of Communication Sciences at Kean College) for his patience in explaining the statistics and his assistance in helping me through this paper.

DEDICATION

I dedicate this paper to my late mother, Rosalinda C. Dikitanan, with whom I would have loved to share what I have achieved.

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Special education programs are mandated in the public education system, both at the elementary and secondary level. In New Jersey the category of learning disabled is composed of two classifications: neurologically impaired and perceptually impaired. Do learning disabilities exist after high school? According to Dowdy, Carter & Smith (1990), they do. They did a study to ascertain how learning disabled (LD) high school students perceived themselves in relationship to the need to participate in transitional programs and to determine the degree to which their perceptions differ with nonlearning disabled (NLD) high school students. Transitional programs could be any one of the following: vocational education program, business office education and on-the-job training. Results indicated that more than twice as many LD than NLD were part of the transitional programs. More than half of each group had established a career goal and wanted additional help in making career decisions. When asked about their immediate plans after high school, the number of students in each group were equal in their response for either college or job employment. Both groups identified parents as their primary source of help either in going to college or in getting a job. The next source for assistance were friends and teachers. The majority of the LD students mentioned that they receive more support in getting a job than going to college. When both groups were asked what would make it difficult to go to college or to get a job, both groups answered grades, personality, and transportation.

Only the NLD group mentioned study skills as a problem. Academic problems were mentioned more times by LD than NLD.

Miller, Snider, and Rzonca (1990) studied the various factors related to learning disabled young adults' decisions to go to postsecondary education. They had ten variables that proved to be statistically significant in making a choice to participate in postsecondary education. These variables were divided into three major groups: cognitive measures of ability and achievement, extracurricular activities, and use of community resources. Results indicated that participation in extracurricular activities was the "major indicator" for deciding to go to college. These two studies indicate that learning disabled students do go and/or want to go to college.

This raises the question that if a student is learning disabled, why does he/she try to get a postsecondary education? Miller, Snider, and Rzonca (1990) answered this question by saying that for a person to be able "to earn a living is becoming increasingly related to postsecondary education." Why is this so? Maybe it's the fact that we live in a very technological society in an ever increasing technological century. By the year 2001, 41% of the job will require average or better educational skills. But the reason does not matter. What matters most is for an individual to survive, and if it means getting a postsecondary education then that's the way it must be. But what happens if this person is learning disabled? Are New Jersey Colleges

responsive to this population? In order to answer this question, let us examine our present laws.

According to P.L. 94-142, "all handicapped children between the ages of 3 and 21, regardless of the type or severity of their disability, shall receive a free, appropriate public education which emphasizes special education and related services designed to meet their unique needs" (Heward & Orlansky, 1988). The majority of students admitted as freshmen are 18 year olds. Is this law then applicable to them or does it mean that it doesn't apply to Higher education...

Section 504 states "... no otherwise qualified handicapped individual shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination in any program or activity receiving federal financial assistance" (Heward & Orlansky, 1988). As a state college, it would appear as if Kean College of New Jersey has the responsibility of meeting the needs of the college learning disabled.

Why is it notable for a person to go to college? At the turn of the century only a small number of people attended college. People without baccalaureate degrees were able to successfully earn a living. Now jobs are rapidly being replaced by the machine and many manufacturing jobs are being moved overseas because of cheap labor. Today, it has become increasingly important to get a college degree just to sustain a reasonable standard of living. However, many

students entering a postsecondary program either do not graduate or take more than four years to complete their studies. Part of the reason for this is that students entering college in New Jersey are required to take the New Jersey College Basic Skills Placement Test (NJCBSPT). This test measures basic reading, writing, and mathematic skills. If a student falls below a certain cut off on one of the areas, he/she is required to take the appropriate developmental course(s). The developmental courses are designed to improve the student's skills in the designated area and facilitate the passing of the NJCBSPT. The taking of these additional courses have added the extra year(s) of study. Failure to meet these requirements before the end of the student's sophomore year could result in dismissal.

At the present time, many high risk Kean College freshmen do not complete their undergraduate studies. In one of the reports of Robert Sitelman (1993), who is the president of Kean College Federation of Teachers, 22% of special admits students and 16% of EEO students who have entered Kean College in 1987, "by 1992, over a five year period, ... graduated." While there are a number of reasons for dropping out of college, learning disabilities seem of paramount importance. Evidence on this topic is lacking. Such evidence as well as the documentation of whether there is a specific set of learning characteristics which interfere with the successful completion of their college curricula would be beneficial in providing intervention strategies.

HYPOTHESIS

To satisfy the purpose of this study it was hypothesized that a significant percentage of incoming high risk freshmen attending Kean College have some form of learning disabilities which interfere with the successful completion of their studies. It was further hypothesized that this disability can be identified for instructional intervention. Additional hypotheses were that no significant correlation would be found to identify the learning disabled, i.e. failure, with measures of word discrimination, visual spatial, visual flexibility, vocabulary, comprehension, spelling, and arithmetic and that no significant correlations would be found between the classification LD (failure) for the same measures plus paragraph listening and visual-motor when done on a subsample.

PROCEDURES

There were four hundred four high risk college freshmen in this study from college freshmen academic groups tested by the Academic Support for Learning Differences at Kean College. Data collection was from Summer 1992 to Summer 1993.

The major sample were administered processing (except visual-motor), cognitive (except reading rate and paragraph listening), and learning styles tests using measures noted below. Because of problems of time and noise conditions in the testing situation, the three test area exceptions were

given only to some of the total sample as seen in the following breakdown:

	N	%	Receiving test measures
Visual-Motor	285	70.5	
Paragraph Listening	292	72.3	
Reading Rate	231	57.2	Nelson Denny C
	173	42.8	Gates-McGinitie F

Test measures used include:

PROCESSING TESTS

Visual Spatial - Closure Speed by L. Thurstone and T. Jeffrey (1956)

Visual Figure-Ground - Closure Flexibility by L. Thurstone and T. Jeffrey (1956)

Visual-Motor - Streak Test by Learning Advancement Center (1983)

COGNITIVE TESTS

Word Discrimination - Word Discrimination by C. Huelsman (1958)

Vocabulary - Nelson Denny Reading Test by J. Brown, J. Bennett, and G. Hanna (1981)

Comprehension - Nelson Denny Reading Test by J. Brown, J. Bennett, and G. Hanna (1981)

Reading Rate - Nelson Denny Reading Test by J. Brown, J. Bennett, and G. Hanna (1981)

- Speed and Accuracy by A. Gates and W. MacGinitie (1965)

Paragraph Listening - Durrell Advanced by D. Durrell (1969)

Spelling - Wide Range Achievement Test by J. Jastak and S. Jastak (1978)

Mathematics - Wide Range Achievement Test by J. Jastak and S. Jastak (1978)

LEARNING STYLE

Learning Styles - Learning Styles Inventory by Brown and Cooper (1983)

After the testing administration, each test was scored. Results were entered into the computer using the Micrograde software program which allowed the researcher to establish final "grade" scores. "Grade" scores were obtained by identifying the total number of raw score "points" per test. All tests were included in the computation of final "grade" scores except the three mentioned above which were not given to all 404 subjects. Each test was assigned the number of points that identified the student as being at grade or achieving at least as well as the "average" student.

Word Discrimination	96	total number of items = 8.3
Visual Spatial	50	percentile considered average
Visual Figure-Ground	50	percentile considered average
Vocabulary	120	represents 12.0 grade
Comprehension	120	represents 12.0 grade
Spelling	120	represents 12.0 grade
Arithmetic	120	represents 12.0 grade
	676	points

Cut off scores were assigned for each test and means were taken for each set (e.g. 676 / 7 = 96 or A) to establish the following grade distribution:

A = 96%

B = 85%

C = 76%

D = 68%

F = below 68%

Students who received a final "grade" score of F were considered learning disabled (LD) in this study. The 404 participants were then divided into two groups: those who received final "grades" of A-D (nonlearning disabled NLD) and those who received a final "grade" of F (LD). Results of the tests per group were analyzed using the ABSTAT statistical program.

NOTE: Although the learning styles inventory was given to all 404 subjects, this was not included in the computation of the final "grade" since students' answers were not considered either correct or incorrect.

DEFINITIONS

New Jersey College Basic Skills Placement Test (NJCBSPT) - test administered to freshmen admitted in New Jersey for the purpose of identifying students who have insufficient skills in reading comprehension, writing, computation, and elementary algebra.

High Risk Freshmen - admitted freshmen whose basic skills are not equal to the freshman college level but who are also identified of being one of two categories:

a. EEO students - those who are part of the Exceptional Educational Opportunities program which provides an alternate college path to those who cannot gain standard college admission. Its participants, who receive intensive academic and financial support services, are largely urban students from lower socioeconomic backgrounds.

b. Passport students - those who are part of the Passport program which is an alternate entrance path for those who are not eligible for EEO assistance and who cannot gain standard college admission. Students are selected on the basis of their potential for academic success when provided with an intensive support program.

Learning Disabled - a person of average or above average intellectual ability who has difficulty in learning and therefore, a discrepancy exists between potential and actual school achievement. This learning difficulty is not primarily the result of a physical, emotional, environmental, cultural or economic factors.

Information Processing or Perception - the input or output of information using any one or a combination of the senses; not a learned skill

a. Auditory - a type of information processing by which information is taken in by listening

b. Visual - a type of information processing by which information is taken in by seeing

(i) figure-ground - ability to take a set of visual symbols and focus on the most important part while screening out the rest.

(ii) spatial - ability to see relationships between the individual and his environment and between items within the environment

c. Visual-Motor (Graphomotor) - ability to coordinate the input of visual symbols with the fine motor output of the hand, writing.

Cognition - different types of thinking skills which occur in the brain; a learned skill of knowledge acquisition

a. Word Recognition - ability to say a word instantly without the use of any decoding skills

b. Vocabulary - ability to know what a word means

c. Comprehension - ability to understand printed material using literal, interpretive, and critical skills

d. Reading Rate - ability to read at the fastest rate possible without compromising comprehension

e. Spelling - ability to say/write the correct sequence of letters in a word

f. Mathematics - ability to do basic computation from

whole numbers through algebra and trigonometry

Learning Style - a "preferred mode of taking in information" (Brown & Cooper, 1983)

a. Learning Styles Inventory - a list of statements designed to find out a person's learning style (Brown & Cooper, 1983)

RESULTS

Of the four hundred four high risk freshmen tested, eighty four students or about 20.8% (20.79) were identified as LD using the criteria noted above. As seen in Table 1,

Table I
Means, Standard Deviation, and t Test Results Between the Samples on the Various Measures

Variable/Sample	Mean	S.D.	t	Significance
Word Discrimination				
LD (N = 84)	89.46	7.56		
NLD (NLD = 320)	96.50	48.41	1.33	NS
Visual Spatial				
LD	17.92	14.01		
NLD	44.88	22.73	10.36	Sig < .01
Visual Figure-Ground				
LD	15.02	11.98		
NLD	40.73	23.28	9.78	Sig < .01
Vocabulary				
LD	86.15	15.23		
NLD	113.35	26.76	8.94	Sig < .01
Comprehension				
LD	66.26	8.98		
NLD	88.58	24.77	8.11	Sig < .01
Spelling				
LD	84.04	10.44		
NLD	94.57	11.52	7.60	Sig < .01
Arithmetic				
LD	61.85	13.01		
NLD	75.48	14.89	7.66	Sig < .01
Total				
LD	62.25	4.25		
NLD	81.43	8.36	20.34	Sig < .01

the NLD sample received a higher mean in all test areas than the LD sample. Of the seven test areas, the four tests that had the largest difference were vocabulary, visual spatial, visual figure-ground, and comprehension. The t between the sample means indicated a significant difference on all variables except word discrimination. Marked mean differences are shown for the six variables significant below the 10,000 level.

Among the eighty four students identified as learning disabled, fifty five took all of the tests. While 118 NLD students also did so, that is, they also took the paragraph listening and visual-motor tests. The total number of points for these fifty five students went up to 896.

Table II shows the mean, standard deviation, and t, of the subsample of LD and NLD students who took the paragraph listening and visual-motor tests.

Table II
Means, Standard Deviation and t Test Results Between the Subsample vs. Measures of Paragraph Listening and Visual-Motor

Variable/Sample	Mean	S.D.	t	Significance
Paragraph Listening				
LD (N = 55)	48.51	15.43		
NLD (N = 118)	62.03	18.82	-4.65	Sig < .01
Visual-Motor				
LD	98.82	21.91		
NLD	118.30	28.13	-4.53	Sig < .01

When looking at the multiple linear regression of the LD group as shown in Table III,

Table III
Multiple Linear Regression

Multiple Correlation Coefficient: 0.999368
Standard Error of Estimate: 0.157991
Coefficient of Determination: 0.998737

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F Test	Prob
Regression	7	1500.29	214.328	8586.48	0.0000
Residuals	76	1.89704	0.0249610		
Total	83	1502.19			

Variable	Regression Coefficient	Standard Coefficient	Standard Error	T	Prob
Disc	0.149819	0.266155	0.00247827	60.4531	0.0000
Spatial	0.146198	0.481502	0.00136440	107.152	0.0000
Flex	0.147074	0.414190	0.00153302	95.9372	0.0000
Voc	0.147079	0.526491	0.00118761	123.845	0.0000
Comp	0.152076	0.321032	0.00208109	73.0750	0.0000
Spell	0.144548	0.354613	0.00180713	79.9873	0.0000
Arith	0.148602	0.454480	0.00144023	103.179	0.0000

results show that all test areas contributed significantly to the final or total "grade" the students received. In this study, the word discrimination test was used so there would be some form of word recognition. The Woodcock Reading Mastery Battery tests of word recognition was not used because it is an individually administered test.

Table IV shows the multiple linear regression of the fifty five students who took all nine tests.

Table IV
Multiple Linear Regression

Multiple Correlation Coefficient: 0.385894
Standard Error of Estimate: 4.76076
Coefficient of Determination: 0.148914

Analysis of Variance for the Regression:

Source of Variance	Degrees of Freedom	Sum of Squares	Mean of Squares	F test	Prob
Regression	1	210.179	210.179	9.27338	0.0036
Residuals	53	1201.23	22.6648		
Total	54	1411.41			

Variable	Regression Coefficient	Standard Coefficient	T	Prob
Disc	0.111419	0.140805	64.6012	0.0000
Spatial	0.109704	0.257340	108.655	0.0000
Flex	0.112134	0.274095	124.975	0.0000
Voc	0.111478	0.330823	154.174	0.0000
Comp	0.114025	0.138495	58.2157	0.0000
Spell	0.110076	0.223589	93.0583	0.0000
Arith	0.110844	0.286296	131.070	0.0000
PgLis	0.111050	0.335228	139.345	0.0000
Writing	0.110753	0.474567	216.228	0.0000

All tests still proved to have contributed significantly to the final "grade".

Table V and VI show the multiple correlation coefficients abstracted from the correlation matrix produced in computation and the percent of variance accounted for by each of the variables.

Table V

Correlation coefficients between total (failures) scores and test measures

N=84	Dis	Spa	Flex	Voc	Comp	Spell	Arith	Total Variance
Total	.52	.39	.40	.39	.37	-.21	.16	
Variance Accounted For	27%	15%	16%	15%	14%	4%	3%	94%

Table V is for the LD sample who took only seven tests while Table VI is for the LD sample who took all nine tests. As seen in Table V, the test of word discrimination accounts for the greatest percentage of the total variance and that the tests of spelling and arithmetic accounted for the least amount whereas the test of writing and listening as seen in Table VI appear to be more highly related to the total score.

Table VI

Correlation coefficients between total (failures) scores and test measures

N=55	Dis	Spa	Flex	Voc	Comp	Spell	Ari	PgLis	Wtg
Total	.39	.35	.42	.28	.43	.29	-.03	.62	.68
Variance Accounted For	15%	12%	18%	7%	18%	8%	.09%	38%	46%

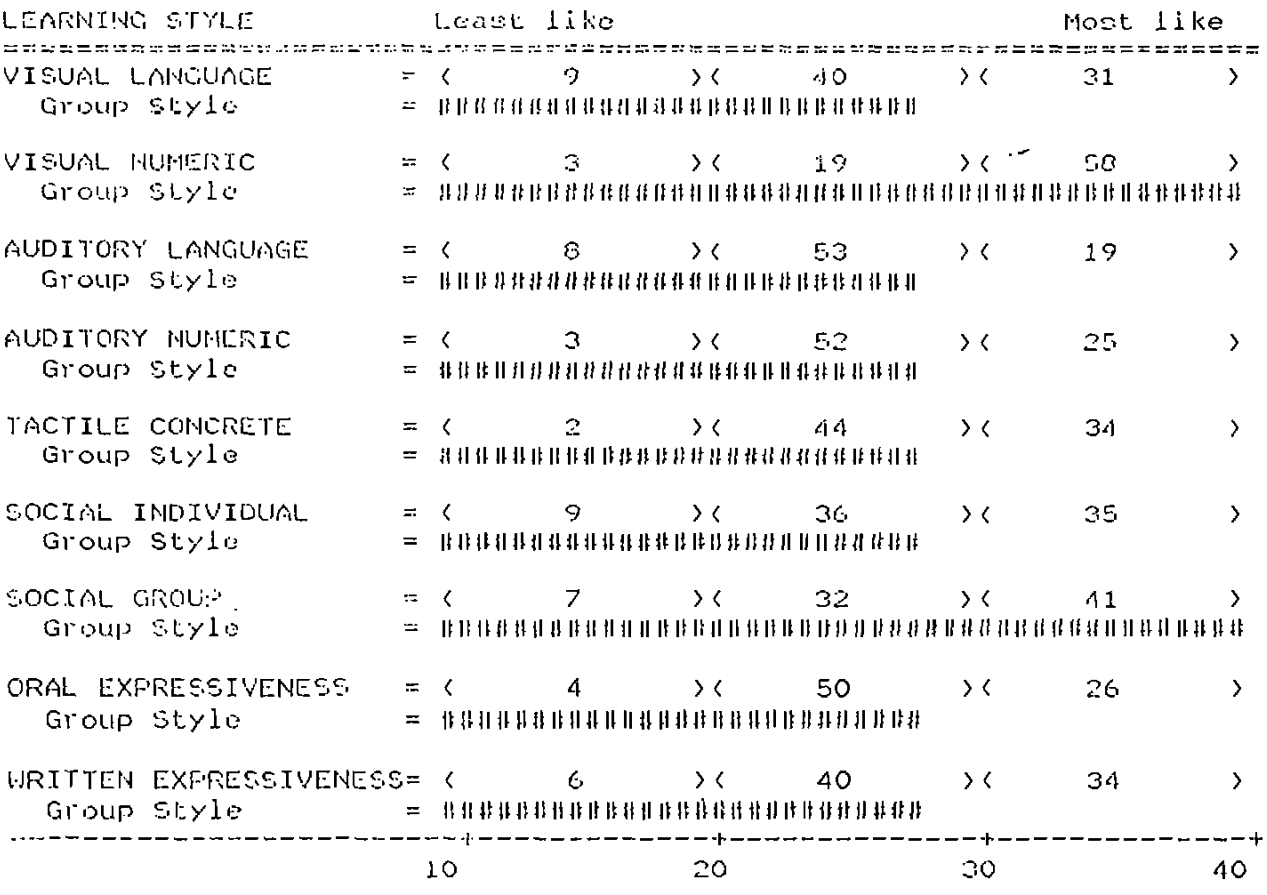
Total Variance = 162%

As shown above, the test of visual-motor (writing) accounts for the greatest percentage of the total variance while arithmetic still accounts for the least amount. A high degree of intercorrelations between the variables is suggested by the total variance.

Table VII shows the learning styles of the LD group.

Table VII
Learning Style

N = 86



Visual Language means you learn language skills by sight, mainly by reading.
Visual Numeric means that you do better with numbers when you see them written.
Auditory Language means that you learn best by listening.
Auditory Numeric means you are better with numbers when you can hear them spoken.
Tactile Concrete means you are a builder and learn best when you can touch what you are studying.
Social Individual means you prefer to work on your own.
Social Group means you learn best by interacting with a group.
Oral Expressiveness means you express yourself best when you talk.
Written Expressiveness means you express yourself best in writing.

Of the 84 students identified LD, 80 of them took the learning styles inventory. As the table indicates, these LD students placed in the middle of the graph on all learning styles, suggesting ambivalence or, at least, non-rejection. This statement is true for all areas except for visual numeric and social group.

CONCLUSIONS AND IMPLICATIONS

A significant percentage of learning disabled students were identified through this study. The screening procedure was successful in identifying the learning disabled and should be continued to provide program modifications for the identified students. Significant correlation between "failure" and individual measures were found and suggest which are most important in a test battery to identify the student and to provide for instructional emphases.

Learning disabled students need to improve their cognitive abilities in vocabulary, comprehension, spelling, and arithmetic. Intervention in these areas should be made in conjunction with processing adjustments in visual spatial, visual figure-ground, auditory, and visual-motor. Poor visual spatial could mean difficulty in grasping abstract concepts such as algebra while visual flexibility could mean inability to focus on what is important on a printed page. Because no auditory processing tests were administered due to the limitations of the test environment, the paragraph listening test was used as an auditory indicator of focus,

retention, and recall of aural information. The format of this test is similar to a classroom lecture-note-taking setting. The visual-motor processing test required the students to copy a paragraph. Scores from this test only focused on the students' rate, LPM -letters per minute, of writing. The quality of their handwriting was not scored because of its subjective nature. In the college setting, students are expected to take notes. If students cannot write fast enough, their notes could be so ineffective that they would be useless for home study.

When dealing with processing and cognitive strengths and weaknesses, one has to remember that at the college level, processing weaknesses have little chance of improving. By this time they are fixed in place. In addition, the intellect is not a factor since the brain is being denied data or provided false or incomplete information. Intellect does operate but only on the basis of incorrectly filtered data. These weaknesses cannot be improved through remediation but their impact can be reduced by modifying the knowledge environment as it is received and expressed. There are at times an improvement in a processing skill because the modification of input and output demands reduces the anxiety surrounding the processing task. In this situation, the processing is still in deficit but it is not being further depressed by the emotionality of the student. A good example of this is the adjustment of the auditory environment through the use of a tape recorder. Students report that they are

more relaxed and are not worrying about missing parts of the lecture. Because of this, they actually are able to follow the lecture in a much more meaningful way. In contrast, cognitive weaknesses can respond to corrective intervention.

Some adjustments that can be made for processing weaknesses are:

Visual spatial - making abstract concepts as concrete as possible

Visual figure-ground - avoiding cluttered pages; blowing up printed materials to maximize use of "white space"; taking tests untimed

Auditory - using tape recorder; providing visual backup to oral presentations

Visual-Motor - using tape recorder (rate); using word processor (quality)

Learning disability programs in the postsecondary level may make recommendations for adjustments but in the environment of "academic freedom", individual faculty may reject these recommendations. Since at present, judicial decisions are limited in this area, colleges generally do what they can and wait for court results.

If a college has accepted these high risk freshmen, giving support to these students would appear to be a moral imperative. It would appear that colleges as an institution of higher learning should limit its admission to students who are either at grade or near grade level. Failure to do this reduces the level of instruction for all other students. The

reality is that the standard of teaching chosen by a professor depends on the quality of students he/she has. Accepting students with significantly deficit cognitive abilities is unfair to the students themselves because they are being given a false hope that they can succeed in college. This unfairness extends to the taxpayers. Why should money be used on students who are so far below college standard that they could never be successful in a four year program? The question then, is what should the cognitive level criterion be for admission?

Students who are in developmental classes tend to concentrate on trying to pass the New Jersey Basic Skills Test. The goal of getting through college work successfully is not a primary concern. The reality however, is that passing a test does not guarantee that the student has the skills to get a degree.

It should be noted that in remediating these students, improvement generally takes longer than a semester. Students and colleges should be realistic in their expectations. If students have significant low cognitive abilities, the college should not accept the role of intensive remediation.

All the tests, even with the two added ones, contributed significantly to the students' final "grade". But it has to be kept in mind that this group of tests were meant to screen for learning disabilities. It would be helpful to lessen the number of tests to be given to avoid fatigue, waste of time, and waste of funds. From the correlation table, spelling and

arithmetic contributed the least amount (less than five percent each) to the final "grade". These two tests could be dropped. The rest of the tests should be given because their correlation to the final "grade" ranged from 14% to 46%.

Since there is no one learning style that fits exactly the learning disabled group, all learning styles must be utilized. This statement is true when dealing with language, tactile concrete, and oral and written expression. It would seem that having the students hear, see, touch, write, and say would result in a greater chance of learning. The above statement is not true when dealing with numbers. Majority of the students prefer to see numbers. They also prefer to work with other people than accomplishing tasks individually. The learning style inventory results support the correlation coefficients between the processing test scores and the final "grade".

An analysis of the screening battery suggests certain weaknesses:

1. no measurement of auditory figure-ground
2. no definitive scores reported on the quality of visual-motor
3. no measurement of reading rate.

To ensure that LD students are adequately served, institutions of Higher Education should provide the following services:

1. screening
2. modification for processing weaknesses

3. remediation of cognitive weaknesses if they fall into a moderate or minimal deficit category
4. academic services should work to provide a holistic approach including career counseling, learning evaluation, instructional intervention, psychological counseling, and financial assistance.
5. Awareness workshops for faculty and staff should be provided to aid in the adjustment of program for LD students.

A caution should be sounded in analyzing processing weaknesses. Learning disabled students are not the only students who have weak processing area(s). The classroom modification that can be given are : an outline of lectures, blow up printed materials, provide visual backup to oral presentations, taped textbooks, and readers. These adjustments can benefit both the LD and the NLD because NLD can have their own preferred learning style. These students have good cognitive abilities but may learn slightly differently.

Colleges would be more successful and popular if they could help their students (LD and NLD) flourish in the real world. Transition to the employment world is important. This transition can start by building a connection between high schools and college institutions. Major characteristics of LD students are ineffective study habits and deficit basic skills. According to Carlson (Brinckerhoff, et al, 1992), subject matter tutoring at the

secondary level should be changed to emphasize basic skills which will better serve the LD student in his learning.

In the first part of this paper, it was reported in one of the articles that LD students received more support in getting a job than going to college. This assumption could not only hurt the students themselves but also the society which may lose what these individuals have to offer. Many of these LD students could succeed both in college and on the outside if modifications were provided.

Problems in the postsecondary level regarding accommodating LD students can be confusing because the laws are not completely understood. Brinckerhoff, Shaw, and McGuire (1992) explained the difference between the P.L. 94-142 and Section 504 of the Rehabilitation Act of 1973. The P.L. 94-142 guarantees children with handicaps between the ages of 3 and 21 a free, appropriate public education in the least restrictive environment. This is supported by federal funds. On the other hand, Section 504 is not a funding law. It only refers to the concept of nondiscrimination. Its most important regulation is program accessibility which include modifications of academic requirements or use of auxiliary aids. Section 504 does not guarantee equal results or achievements but only equal opportunity. The extent of modifications for the LD is vague because of "limited judicial clarification". Institutions are not required to lower their program requirements and the LD students should be qualified except for their disability.

Another major difference between P.L. 94-142 and Section 504 is who is responsible for overseeing the needs of an LD student. In the former statute, the responsibility lies with the local educational agency. While in the latter, the responsibility lies with the student. This may not work in higher institutions because young LD students are embarrassed to admit that they were at one time diagnosed LD. LD students need to be educated about their own situation. Because colleges cannot rely on these students, screening at the postsecondary level would identify the high risk students. After identification, an individual interview can be carried out to ascertain the presence of preexisting learning disabilities. In this study, the college community and the student would be better served if the screening and interview procedure were extended to the D's and C's students. This group, possessing higher cognitive abilities, is more likely to succeed in the college setting.

In conclusion, a group of learning disabled high risk freshmen is significantly represented. These students showed highly significant scores in the areas of processing and cognition. There was no specific learning style preferred by these students except in the areas of visual numeric and social group.

Learning Disability Characteristics of High Risk Freshmen: Related Literature

Learning disabilities is a fairly new field (Lerner, 1993). For this reason, various opinions, theories and treatments are currently available. Parents and educators have agreed that there is a certain population of children who have learning difficulties. This is why the term "learning disabilities" was suggested by Samuel Kirk. Although the term has generally been accepted, people have had and still do have difficulties defining it. The most widely accepted definition is that contained in federal Public Law 101-476, called Individual with Disabilities Education Act (IDEA) and the "earlier version of this legislation, PL 94-142. The federal definition actually has two parts. The first part is concerned with IDEA.

The term "children with specific learning disabilities" refers to those children who have a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written. The disorder may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. Such disorders include perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. These terms do not include children who have learning problems which are primarily the result of visual, hearing, motor handicaps, mental retardation, emotional disturbance, or of environmental, cultural, or economic disadvantage. The second part of the definition is operational, determining if a student has a

specific learning disability if he/she "does not achieve at the proper age and ability levels in one or more of several specific areas when provided with appropriate learning experiences" and a severe discrepancy exists between "achievement and intellectual ability in one or more of the seven areas: oral expression, listening comprehension, written expression, basic reading skill, reading comprehension, mathematics calculation and mathematics reasoning.

HISTORY OF LEARNING DISABILITIES

Learning disabilities has always been with us but it was only recently that it has received legal sanction. It has its roots as far back as the 1800's (Lerner, 1993). During the period of basic scientific research on the brain and its disorders (1800-1930), there was a belief in phrenology, meaning "abnormal behavior and brain function could be predicted by examining the shape of a person's skull." In 1860, Paul Broca discovered that certain areas of the brain were damaged in adults who lost the ability to speak and had died. John Jackson and Carl Wernicke believed that there were specific areas in the brain that are responsible for certain activities. Word blindness, coined by James Hishelwood, which he defined as the "inability to interpret written or printed language despite normal vision." Kurt Goldstein who worked with brain injured soldiers found that they had perceptual impairments which could be observed as

difficulties in foreground-background (figure-ground), distractibility to external stimuli, and perseveration. Heinz Werner and Alfred Strauss transferred Goldstein's work to brain-injured children.

In about 1930 - 1960, "scientific studies of the brain were applied to the clinical study of children and translated into ways of teaching." Alfred Strauss and Laura Lehtinen came up with a new category called brain-injured children. These children displayed severe behavior disturbances. Strauss suggested that the brain-injured children's behavior and learning patterns were indications of brain injury. His suggestion was very different from that of other professionals at the time. It was held that the behavior disturbances had emotional origins. Brain injury could occur in a child's life in any of the following times: before birth, during birth, or after birth. Strauss recognized and named certain behavioral and biological characteristics. The behavioral characteristics listed were perceptual disorders, perseveration, conceptual disorders and behavioral disorders. Biological characteristics included soft neurological signs, history of neurological impairment, and no history of mental retardation in the family.

The term "brain-injured" has its own shortcomings. It confused people because not all brain-injured children have learning disorders. Terms like Strauss syndrome and minimal brain dysfunction started to be used. Then in 1963, Samuel Kirk suggested the term learning disabilities. Between 1960

and 1980, laws like PL 91-230, PL 94-142, PL 101-476, and PL 102-119 have been mandated to assist those considered to be learning disabled.

The biological characteristics Strauss had suggested are only one of the perspectives from which learning disabilities can be viewed, neuropsychological (Wallace and McLoughlin, 1988). Brain-behavior relationships can be examined through neurological or physiological methods like: electroencephalogy, brain scanning, cortical electrostimulation, autopsy studies, use of drugs and chemicals, and biofeedback training. Other areas included in a neurological examination are medical history, examination of cranial nerves, analysis of motor functions, psychological tests of sensory and other functions. We need to remember that associations of learning disturbances based on "soft" signs are hypothetical. Some "soft," neurological signs are impulsivity, inattention, hyperactivity, and poor coordination. Beside the neurological perspective of learning disabilities there are developmental, cognitive, linguistic, learning theories, and ecological ones.

Learning disabilities is often "associated primarily with dyslexia" which is unfortunate because many learning disabled people have good reading skills and those with "dyslexia can have one of many types of dyslexia, with or without other symptoms" (Bonnet, 1989).

Learning disabilities is not a legal term in New Jersey. Other terms that are currently being used in the field are

1. culturally and linguistically diverse - describes the changing population in our society. Schools are now faced with educating students from all kinds of cultures.
2. Attention Deficit Disorders - characterized by having difficulty staying on task, focusing attention, and completing work. It comes in two types: ADHD - Attention Deficit with Hyperactivity Disorder and ADD/WH - Attention Deficit Disorder without Hyperactivity. This is not a learning disability but a disorder associated with learning disabilities. Coles (1987) raised the "difficulty of knowing what exactly attention deficits are."
3. mild and severe learning disability - knowing the "level of severity is helpful in placement and in developing teaching plans"
4. Restructuring the educational environment - Children with disabilities who cannot be served in regular education receive service in special education. Now the trend is changing. The idea of coordinating regular and special education is not new (Lerner, 1993). In the November/December 1989 issue of Reading and Special Education, Maynard Reynolds mentioned REI - Regular Education Initiative. Its basic principle is to accommodate more disabled students in general education classes and schools under the direction of the regular classroom teacher (Lerner, 1993). REI has

been suggested for the following reasons:

1. near total failure of special educators to demonstrate that programs that involve separate resource rooms, classes, or schools have distinctive merit for services to disabled pupils, especially those with mild handicaps
2. the unreliable methods used to classify and place students in special programs
3. the growing numbers of children who are at risk for school failure
4. high cost of diagnostic procedure
5. stigma associated with negative terms used in the classification and labeling of pupils
6. emergence of ideas based on solid research to improve general education programs that presumably would make it possible to reduce the numbers of students referred to special education
7. research evidence that programs offered to several categories of handicapped and at risk students are not distinctive
8. the increasing interest in the restructuring of schools, such as teams of educators can work together to serve students who have special needs.

Berryman (1989) mentioned in his article that adults from the general population have a favorable attitude toward the "concept of integrating handicapped students into the general classroom." Those who were not in favor might have been

afraid of the consequences and others might have had negative experiences with mainstreaming.

THEORIES OF LEARNING AND ITS IMPLICATIONS ON VIEWING LEARNING DISABILITIES

1. Neuropsychological perspective - views causes of learning disabilities as something internal (Wallace & McLoughlin, 1988) But Gerald Coles (1987) has raised doubts as to the truthfulness of a neurological condition.
2. Developmental psychology and maturational theory "proposes that there is a sequential progression in the maturation of cognitive skills, and a child's ability to learn will depend on her or his current maturational status."

   - does not favor skipping or speeding up the process which may only create more problems

2. Behavioral psychology and direct instruction
   - behavior analysis requires teachers to "analyze academic tasks in terms of the skills students need to accomplish the task"
3. Cognitive psychology and learning

   Cognitive psychology, or information processing psychology (Diggory, 1978), is concerned with the human processes of learning, thinking, and knowing or mental processes. These psychological processes are needed for learning to occur. Psychological processes are the abilities in the following areas: perception, motor, linguistic, and memory functions.

The backbone of this study is based on the concept of psychological processing. According to Rivlin and Gravelle (1984), the "senses...perform the job of breaking down the continuum of reality into tiny, discrete pieces that can be analyzed by the sensory system's receptor, then reassembled in the brain into a coherent form again". What a person perceives then may not be the real information coming from the outside. But the person believes what his senses are telling him because his brain has picked it up. If what the brain has picked up is false, then the person will end up with the wrong information not because he was wrong but because of faulty perception. It is important to remember that learning disabled people have normal sensory functioning (Coles, 1987).

ASSESSMENT OF LEARNING DISABILITIES

Assessment of learning disabilities starts at the referral stage (Lerner, 1993). The student being referred will eventually be seen by each member of the child study team and an Individualized Education Plan will be developed if student is to be classified. Bush and Waugh (1976) stressed the need for teacher assessment because of the growing number of student referrals. Lack of trained personnel has caused waiting period before a student can be seen for evaluation.

"Diagnosis in any field is a complex process that involves a search for patterns such as theory-driven assessment, ongoing hypothetical testing, and decision making to

determine the nature and scope of the problem (Johnson and Blalock (1987). They mentioned that in special education, one requires an understanding of both normal and atypical learning, an awareness of potential breakdown and symptomatology associated with various handicapping conditions."

Learning disabilities assessment can be administered in any one of the following ways: individual, small group, or large group. Sometimes before an in-depth assessment is done, some kind of screening is given. Some people may ask why search for more problems when doing a screening. The goal of screening is to "find children and help them before they have too much failure at school" (Adelman & Taylor, 1986). A question published in Adelman's and Taylor's book (1986) is "why don't we talk about improving schools to keep kids from becoming learning disabled?"

Additional functions provided by screening programs are better placement (may consist of matching pupils to teachers according to the pupil's needs), economic advantage (cheaper to face the problem at an earlier stage), and acquisition of baseline data of students' characteristics (Johnson & Morasky, 1977).

Is it important to provide learning disabilities screening at the college level? The writings of Lerner (1993) and of Johnson & Blalock (1987) clearly indicate the presence of learning disabilities at the college level and the need to address the problem. Presently, many publications are

discussing the issue of learning disabilities at the college level. In addition, if these students with learning disabilities are to succeed, they need to receive some kind of assistance. This assistance should stem out of the screening process. One has to remember that when diagnosing adults, including college students, keep in mind that despite motivation and persistence, adults are vulnerable because of repeated failures and frustrations. They have developed coping strategies to hide their problems (Johnson and Blalock, 1987). After the referral and/or the screening stage, a multi-disciplinary evaluation should be carried out. The team then decides with the parent's consent, if child is a minor, whether to classify the child or not. If classified, an Individualized Education Plan (IEP) is then drawn up, followed by implementation of the plan and monitoring of progress (Lerner, 1993). At the college level, there is no required legal document to be developed for a student to "follow" under the guidance of a teacher. There has been a suggestion of making an Individualized College Plan (Siperstein, 1988). Siperstein has called for a "programmatic approach to critical transitions." He talks not only about entering college and managing academic and social changes during college but also exiting college to enter employment. Janis Rusch and Frank Rusch (1991) included in their article the emphasis on facilitating transition from high school to adulthood.

The criterion of being labeled learning disabled is

different from state to state. Most states use the concept of discrepancy score that "measures the gap between the performance and potential" (Lerner, 1993). Some key assessment questions has been provided by Wallace and McLoughlin (1988) such as level of academic achievement, level of expected school performance, discrepancy between actual and expected achievement, specific skill deficits, and underlying factors.

One of the problems in not being able to provide service right away to college learning disabled students is the fact that they do not inform any empowering college staff member of their condition. Questions about disabilities are not included in the application to Kean college (Vega, 1993). The problem found in some college LD students, who have been classified in the past, is that they do not even understand their condition.

Assessment usually results in some derived score based on how a sample group of tested population fared. The question posed by McGuinness (1985) is who is normal. Normality to a certain extent is subjective. There is a popular opinion that "intellectual abilities are entirely a product of the culture." The following is a deviation from grade level eligibility criteria from Lerner (1993):

Primary grades - more than 1.0 years below current grade level

Intermediate - more than 1.5 years below current grade level

Junior high school - more than 2.0 years below current grade level

Senior high school- more than 2.5 years below current grade level

McGuinness (1985) mentions that being labeled can be positive as well as negative because it can "produce symptoms much worse than those that led to the diagnosis in the first place." She also mentions that laymen thinks of dyslexia like it is some sort of disease since the brain is involved with reading. Laymen think that if a person has trouble with reading, there must be something wrong with the brain.

It is clear that having learning problems or differences requires a modification in how information is to be learned if the student is to be successful.

INFORMATION PROCESSING AREAS AND HOW THEY CAN AFFECT LEARNING OR COGNITION

Before going into the different information processing areas, "learning" needs to be defined. In a society like ours, learning is important. But what actually is learning? Mikulas (1974) defined learning by comparing it with performance. He described performance as "what an organism actually does." Performance then, is how a person behaves. Learning, on the other hand, "refers to behavior potential." It "specifies what an organism is capable of doing." Learning cannot be observed directly. That is why it is studied through inferences based on performance. Learning is

therefore a "relatively permanent change in behavior potential which occurs as a result of practice."

Mikulas also talked about perceptual learning. A person attends to a stimuli from the environment and then constructs meaning out of it. The following are the theories associated with perceptual learning:

1. Gibson's Theory

   Perceptual learning is "learning to extract information out of the sensory data of the environment." It has two components. First, a person must learn what the distinctive features are. Second, a person must learn how to use the distinctive features to discriminate between different relevant objects. The processes involved in perceptual learning are abstractions, filtering out irrelevant variables, and selective attention.

2. Transactional Theory emphasizes extrapolations from limited information. Perception is considered to be dependent on the person's past transactions with the environment. Perceptual learning is an active process of interpretation of environmental events in terms of the person's purpose, values, and past learning.

3. Categorization influences perception. Categories by which things are classified are generally a result of learning.

4. Hebbian model views neural representations that correspond to environmental stimuli and that learning

involves neuron associations between such representations

What is information processing?

Lerner (1993) describes the information-processing model of learning as a representation of how information flows during the learning process. This same concept is described by Johnson and Blalock (1987) as input-integration-output-feedback. Seamon (1980) described information-processing approach as "concerned with the operations between a stimulus and a response." A major assumption of information processing is that "perception is not an immediate outcome of stimulation, but is the result of processing over time" (Haber & Hershenson, 1973). It also "assumes that experimental operations could be devised to examine the contents of the stimulus information at every point in the sequence." But what is perception? According to Rampp (1981), perceptions is the process of attaching meaning to sensation. He also mentioned that for the stimulus to be perceived correctly, "there must be sensory stimulation, and intact sensory end organ, and an adequately functioning neuronal system."

In some ways, people use information in the same way as a computer (Lerner, 1993). Information is put in the computer via keyboard, joystick, or mouse. It is then processed or worked on in the central processing unit (CPU). When a person needs information from the computer, he gets it via monitor screen, printer or speech synthesizer.

According to Johnson and Blalock (1987), input of

information can be auditory, visual or haptic. What people do in the integration or in the CPU is any one of the following: attention, perception (discrmination, analysis, synthesis), memory (short and long term memory and recognition and recall), symbolization, conceptualization and intersensory integration. Output or modes of response can be visual, auditory, visual-motor, and auditory-motor.

The integrative process done by the brain, as explained by Ayres (1975), is defined as the "interaction and coordination of two or more functions or processes in a manner which enhances the adaptiveness of the brain's response." The sensory stimuli enters the central nervous system but the brain is responsible for filtering, organizing, and integrating the information it has received "so that it can be used for the development and execution of the brain's functions." These intermodal associations occur at all brain levels but at the higher levels, additional nonsensory processes such as memory and reasoning are involved. Intersensory integration follows a developmental sequence, with most rapid maturation of function occuring at eight years of age.

According to Tarnopol and Tarnopol (1977), it was first believed that "each different form of behavior must be regulated by a specific group of brain cells." This concept was proved wrong when Lashley experimented on rats. He found that the "rat's loss of ability to traverse a maze was dependent on the amount of brain removed rather than on the

specific parts of the brain removed." This led to an holistic theory which views brain as an organ that functions as a whole. The belief then changed: behavior is seen as a result of a sequence(s) of activities in "groups of brain cells temporarily acting together." "If one of the unit dysfunctions, the resulting behavioral performances will be impaired."

There are various information processing areas. For the purpose of this paper, I will discuss only three: auditory information processing, visual information processing, and visual-motor (graphomotor) information processing. Please note that the terms information processing and perception will be used interchangeably.

What is auditory information processing?

Tarnopol & Tarnopol (1977) described auditory information processing as a closure process. A person receives some auditory information, thinks about the information which then goes to his short term memory storage. The information is compared with his current schema. He understands this information when he recognizes its meaning. This may mean remembering past experiences. The recognition of meaning of the information needs to take place so that final recoding occurs. Information is then passed from the short term memory to the long term memory. This transfer makes the short term memory available to take in new data or information. Woodcock (1976) defined auditory perception as

the "ability to process information obtained through the auditory modality." Based on Rampp's article (1981), the auditory perception concept is based upon listening. When a person listens, he attends.

When administering auditory processing tests, learning disabled children have normal audiograms. This means that their auditory acuity is normal. What these children have trouble with is auditory perception. The auditory modality is important in a child's success in the classroom (Rampp, 1981). The modality is crucial in efficient reception, integration, and assimilation of new information and knowledge.

A number of sensory and processing variables take place between the reception of a word or sentence at the eardrum and its final understanding by the person. If any one of these processes is deficient, the person will experience difficulty in interpreting the auditory information he has received (Tarnopol & Tarnopol, 1977).

Selective attention is an important consideration in gathering information aurally. Attention plays an important role in learning (Rampp, 1981). According to Leisman (1976), "attention can only be focused on specific stimulus and, therefore, attention is intimately associated with motivation and learning." Haring (1968) describes attention as an act that cannot be observed directly. To verify if a person is actually attending to a stimulus, we need to observe his responses. Attending and responding are then synonymous.

Theoretically, auditory information is received in the short term sensory storage. The information stays long enough so the brain can know and pick out which information are important. The sorting out of relevant information is accomplished by figure-ground differentiation process. Subvocal rehearsal is important if information is to be transferred to short term memory. At this point, the person no longer has all the information he received at the beginning but he has an interpretation of what is important. This auditory figure-ground disturbance is shown when there is "difficulty in selecting appropriate auditory signal to which to attend" (Rampp, 1981).

According to Woodcock (1976), other processes involved in auditory perception are auditory discrimination, auditory synthesis, and auditory analysis.

Auditory discrimination is the "ability to distinguish between sounds which are highly similar." Auditory synthesis which he calls sound blending, is a "cognitive integration of phonemes that have been presented separately, resulting in recognition of a syllable or a word." Auditory analysis or sound analysis is the ability to analyze spoken syllables or words into their component sounds or phonemes. A person needs to perceive the sequence and recognize the correct order for each sound. This ability is important in learning phonic skills, spelling, and dictionary use. Auditory memory is described in terms of its deficiencies. Auditory memory deficits are suspected to contribute difficulties in verbal

learning and communication. Memory is considered to be a higher-level cognitive process. It plays an important role in language skills because language is made up of sequential events. A person, therefore, must be able to remember the language event occurred and reconstruct the order in which it has occurred. Auditory memory is "occasionally found to be the only deficit in otherwise normal child has, but a deficient reader may have more" (Kaluger and Kolson, 1969). Rampp (1981) views short term memory as the most important for acquiring speech and language skills. He said that this is usually evaluated by "using digits or sentences and having the child imitate the tester's verbalizations."

Auditory processes do not confine themselves at any one point. They run along a continuum of mental functioning where at the one end of the spectrum is auditory acuity, followed by auditory perception described above. And at the other end of the spectrum is auditory comprehension (Woodcock, 1976).

What is visual information processing?

According to Haber and Hershenson (1973) visual information processing begins with a sensory response to light stimulus. This brief visual or iconic stage occurs when information from the light is internally reflected on the retina. The perceiver only has one-quarter of a second in which to process the content of this representation. Then the information is transferred to a more stable or permanent

storage. The short term memory encodes visual information into linguistic or conceptual representations which may be contextual or in a series. These meaningful representations are then stored in the long term memory.

Of major importance to this study are two visual processing areas: figure-ground segregation, the ability to sort the central from the background stimulus in a field, and spatial organization, the ability to see relationships between the individual and his environment and between items within the environment.

Haber and Hershenson (1973) explained that in figure-ground segregation one of the objects is seen on surface against the others in the background. They cite the Gestalt law to explain this visual process, the "tendency for any two elements in the visual field to be grouped into larger units depends upon certain "relations" between them". According to Leisman (1976), eyes constantly move by rapid jumps and is never at rest for more than a few seconds at a time. The "visual perceptual system must include some method of accumulating and storing information." One must also be able to extract the important information from the "rapidly changing signals." Thurstone and Jeffrey (1966) developed a test called Closure Flexibility, which "measures ability to hold a configuration in mind despite distraction."

The other area of importance is visual spatial, the capacity to organize the visual environment. To do this, one must be able to see relationships between himself and his

environment and the between items within the environment (Andrews, 1990). Luria (Leisman, 1976) described this operation as a form of integrative cortical activity. First is simultaneous synthesis which "involves integration of individual stimuli arriving in the brain and forming simultaneous groups that are usually spatially organized. Visual inputs are received in a series and integrated into a whole image. If a person is deficient in this aspect, he will end up with visual agnosia where the object cannot be recognized as a whole.

A test to measure the spatial environment was designed by Thurstone and Jeffrey (1966). In order to be successful, an individual has to "perceive an apparently disorganized or unrelated group of parts as a meaningful whole.

Visual processing skills are clearly fundamental to cognitive acquisition of information presented through visual symbols. Spatial deficits restrict success in subjects like arithmetic where problems with visualization interfere with success with time, money, tables, fractions, geometry etc. In addition, this area causes difficulty with number sequence, placement, sign reading, and omissions. A restriction in the figure-ground area causes problems with reference texts, graphs, maps, charts, and a general difficulty dealing with material that is jammed with visual symbols (Andrews, 1990).

What is visual-motor (graphomotor) processing?

In this study, graphomotor processing is considered as the ability to coordinate visual input and motor output to legibly write or copy material at an adequate rate for the individual's age. In a paper by Robert Andrews (1985), the goal of penmanship instruction is stated as the ability to "produce a free flow of thought onto paper with a minimum emphasis on the form of writing." The following is a list of legibility components: slant, spacing, size (height and proportion), alignment and balance, quality of line or pressure, straightness, margins, speed which can be developed only after legibility has been established.

Kaluger and Kolson (1969) believed that the development of visual perception aids in visual-motor coordination by differentiating like and unlike, identify symbols in their proper spatial and temporal relationship and developing of visual scrutiny. Luria (Leisman, 1976) describe the visual-motor relationship as a successive synthesis which "involves integration of external influence into a serial order as seen in rhythmic movements such as writing and narrative speech." It is primarily associated with motor system. Keith Beery (1967) mentioned that there are two types of functional anomalies in visual motor integration. First is malfunctioning within a part like visual processes. Second is malfunctioning of the interactions among the part like visual-motor processes. Kephart (Leisman, 1976) listed the basic skills as: gross motor ability, eye-hand coordination,

laterality, directionality, good body-image and dexterity. Accurate visual-motor coordination depends upon the development of visual, oculo-motor, and motor systems.

Dysgraphia, according to Kaluger and Kolson (1969), is poor writing which demonstrates the "inability to express ideas by means of writing or written symbols, probably due to a neurological effect." It is "characterized by inability to form letters properly and to combine well-formed letters into meaningful words or symbols."

The inability to efficiently and effectively perform graphomotor tasks critically restricts performance in the classroom. Of special note would be problems with copying or notetaking and in subjects that were writing based like composition and arithmetic (Andrews, 1985).

LEARNING STYLE

Brown and Cooper (1983) defined learning style as a "preferred mode of taking in information." Vicki Snider (1992) mentioned in her article that the learning style approach is based on the premise that learning style can be determined and the results can be used to establish instructional methods. Maria Carbo (1992) indicated in her article that learning style researchers do not believe that people can be put in neat categories. This is no surprise since people are complex organisms who do not even understand themselves. What is good about the learning style approach is that teacher advocates learn how to teach various kinds of

methods. Carbo cited Dunn's and Dunn's model where they did longitudinal studies that indicated "auditory and visual perception abilities are significantly related to school achievement and that the rate of development varies among and within individuals, with visual and auditory processes developing independently of one another."

Snider (1992) suggested that use of learning styles in determining "methods of reading instruction must be viewed with skepticism" because Hammill, Goodman, and Wiederholt and Newcomer and Larsen found that special educators who tried to determine and remediate perceptual-motor processes... to facilitate acquisition of reading skills were found not to improve reading achievement." Carbo admitted that most research in matching students' modalities and reading methods that were done in the late 1960's and early 1970's did not report significant results. But she argued the sizable portion of the research and said that they contained "serious procedural errors and/or design flaws."

It is the belief under which this study is being conducted that teaching students through their preferred mode has impact on cognitive achievement. Tachibana (1986) did a study under a model presenting the concept that "students perform better on learning tasks presented in a modality consistent with their learning strengths."

According to Snider (1992), learning style is not a new educational trend. But it is an area educators have not really met students' needs.

Velten and Sampson (1978) mentioned that treatment of learning disabilities is "outside the child in the environment. If you wish to change the child's behavior so that he shows learning, you must make changes in those portions of his environment which are instructional."

EFFECTS OF LEARNING DISABILITIES

Learning disabilities does have an effect on school subjects like reading (Coles, 1987; Lerner, 1993) and mathematics (Lerner, 1993; Wallace & McLoughlin, 1988). Content area subjects can also be difficult due to reading skill and abstractibility level of concepts.

Processing abilities affect cognition. According to Wallace & McLoughlin (1988), cognition refers to the "process of knowing and thinking and that cognitive skills are an essential human function." Cognitive operations include "judgment, comparison, calculation, inquiry, reasoning, evaluation, critical thinking, concept formation, problem solving, and decision making."

Children with reading disabilities, throughout history, have been classified according to various terms like strephosymbolia, alexia, word blindness, minimal brain dysfunction and dyslexia. Types of reading problems have roots in visual and/or auditory processing (Wallace & McLoughlin, 1988).

Auditory perception affects classroom learning (Rampp, 1981). To be successful in the classroom, a student "must

listen to the teacher, separate important message from interfering noise, understand what is said to him and follow directions given in proper order."

College classrooms mostly follow an aural-written pattern. If a student has auditory sequential memory difficulty, he will have trouble remembering what the professor said. He has to remember the information long enough for him to write them down in his notebook. This is very important in classes filled with aural information with no visual backup and in mathematics classes where sequence of steps to solve a problem is crucial.

In Leisman's book (1976), he mentioned that Luria pointed out that "local lesions seldom lead to the loss of any specific isolated mental function, but always to the disturbance of a large group of mental processes forming a syndrome."

Kephart posed a cause and effect relationship between perceptual motor and academic achievement (Hallahan and Cruickshank, 1973). Researchers like Keogh and Smith, Snyder and Freud, and Skubic and Anderson have found positive relationship.

According to Kaluger and Kolson (1969), "being able to read efficiently and effectively depends upon what the brain does with the various sensory inputs of stimuli."

Students who have weak visual figure-ground processing will have trouble with cluttered pages. When they take a timed test, they will have to use time up in finding their

place on a page. A way to get around this is to blow up the test or have them take it untimed. A drawback of untimed is they may experience fatigue (Tachibana, 1986).

Schools rely heavily upon students' writing skills (Andrews, 1990). If a child then has visual-motor processing problems, he may talk, wander around, or break his pencil. Although these behaviors are atypical in the college setting, college students who have trouble with this processing area may submit illegible work or have poor notes because they cannot write fast enough when listening to a lecture.

In review of this literature, we can see that learning disabilities is a fairly new field with roots that go back as the 1800's. Various theories have been developed to try to explain this condition. Learning disabilities is a condition that needs to be assessed by a multidisciplinary professionals. It must be done as early as possible so one may intervene before the situation becomes worse.

In this study, information processing theory was used. It was defined and kinds of information processing areas were discussed. Each area has its own cognitive sector that may get affected if weak. Learning style was defined and effects of learning disabilities on school success was discussed. It is vital to carry out the assumption that learning disabilities is a condition that can be alleviated if the environment is modified to meet the needs of students with learning disabilities.

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APPENDICES

Appendix A: Learning Disabled Raw Scores in Seven Tests

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
1	90	86	27	60	68	91	36	67.8
2	94	27	12	89	60	91	62	64.3
3	90	27	12	96	75	109	43	66.9
4	91	4	24	64	81	85	66	61.4
5	55	5	16	75	60	81	66	53.0
6	92	14	18	77	81	79	53	61.2
7	91	10	14	70	75	97	56	61.1
8	95	27	31	83	71	89	39	64.3
9	94	10	21	96	87	85	53	66.0
10	90	14	8	101	93	87	62	67.3
11	79	18	27	99	59	89	76	66.1
12	82	2	21	81	73	93	66	61.8
13	92	4	10	105	93	89	66	67.9
14	91	18	34	68	60	79	72	62.4
15	85	18	4	117	63	72	78	64.6
16	93	21	12	86	70	97	62	65.2
17	96	21	18	83	81	93	56	66.3
18	94	18	8	81	60	89	76	63.0
19	94	10	16	62	70	89	59	59.2
20	81	5	16	92	63	83	39	56.1
21	84	5	4	73	66	95	53	56.2
22	71	1	7	68	60	91	46	50.9
23	92	5	54	75	81	87	50	65.7
24	95	42	12	68	75	102	43	64.6
25	94	24	10	79	70	102	66	65.8
26	94	4	5	79	83	69	72	61.5
27	94	46	8	61	87	67	72	64.3
28	81	38	7	77	66	72	81	62.4
29	73	14	2	79	60	81	59	54.4
30	94	1	2	81	60	91	50	56.1
31	61	4	2	127	60	83	56	58.1
32	94	34	5	81	66	83	88	66.7
33	91	42	54	92	83	75	14	66.7
34	93	10	27	96	60	91	50	63.2
35	82	5	14	81	70	83	59	58.3
36	94	21	18	96	60	93	62	65.7
37	91	5	21	92	60	95	84	66.3
38	85	34	24	66	60	64	78	60.8
39	79	1	3	66	60	77	59	51.0
40	92	18	12	83	77	95	46	62.6
41	91	1	8	105	60	67	57	57.5
42	93	14	1	75	75	102	62	62.4
43	92	42	16	77	60	89	76	66.9
44	96	18	21	75	60	67	46	55.9
45	88	18	18	114	60	93	53	66.3
46	91	34	21	81	60	91	46	63.5
47	88	21	46	92	60	75	76	67.8
48	91	27	21	86	60	81	56	62.4

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
49	94	1	8	117	60	97	72	66.4
50	93	34	16	79	60	62	76	62.1
51	94	18	5	81	63	93	59	61.1
52	85	14	4	89	60	77	66	58.4
53	91	10	1	86	60	83	69	59.2
54	95	27	14	79	66	95	53	63.5
55	94	27	27	81	60	81	66	64.5
56	90	10	27	77	60	85	76	62.9
57	82	27	1	96	60	67	69	59.5
58	92	14	12	77	60	81	53	57.5
59	93	10	14	101	66	79	62	62.9
60	86	5	14	117	60	99	59	65.1
61	96	21	12	120	60	77	59	65.8
62	87	34	24	73	60	64	66	60.4
63	92	21	42	89	75	77	56	66.9
64	88	18	10	105	60	81	56	61.8
65	93	5	1	129	81	91	59	67.9
66	90	27	12	81	66	69	59	59.8
67	94	21	42	92	60	77	72	67.8
68	66	18	34	81	60	62	69	57.7
69	95	5	3	73	60	67	62	54.0
70	88	18	1	77	60	91	84	62.0
71	91	4	4	83	60	85	56	56.7
72	94	14	18	81	60	81	88	64.5
73	91	42	8	77	60	72	76	63.0
74	91	18	5	68	60	81	53	55.6
75	94	5	8	92	81	102	59	65.2
76	95	18	24	101	60	91	62	66.7
77	93	10	31	111	70	83	59	67.6
78	95	14	14	86	70	87	81	66.1
79	95	10	10	89	60	77	39	56.2
80	91	14	1	86	60	77	76	59.9
81	86	2	1	75	60	91	69	56.8
82	95	46	5	92	60	83	59	65.1
83	95	21	12	77	60	89	81	64.3
84	94	14	5	109	66	77	69	64.2

Appendix B: Non-Learning Disabled Raw Scores in Seven Tests

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
1	92	62	84	149	100	99	100	101.5
2	89	86	12	86	108	30	50	68.2
3	95	79	45	109	100	102	50	85.8
4	90	69	62	109	141	64	97	93.5
5	95	21	21	120	63	105	53	70.7
6	94	69	46	150	138	107	62	98.5
7	93	21	50	131	93	114	84	86.7
8	95	54	12	109	128	95	53	80.8
9	93	46	24	114	100	91	66	79.0
10	94	76	50	117	108	83	59	86.8
11	91	62	54	145	85	97	62	88.2
12	95	54	54	124	138	91	69	92.5
13	93	66	12	114	132	112	76	89.5
14	96	27	21	101	75	91	92	74.4
15	94	73	31	117	132	87	46	85.8
16	94	46	46	86	100	52	84	75.1
17	93	4	12	127	122	95	88	80.0
18	96	54	8	131	147	97	56	87.1
19	86	27	46	92	63	81	81	70.4
20	96	18	31	127	128	119	81	88.8
21	95	42	16	92	75	102	78	74.0
22	91	34	42	92	96	93	69	76.5
23	96	90	42	140	100	105	78	96.3
24	95	73	10	89	87	87	72	75.9
25	96	42	58	150	122	119	97	101.2
26	96	18	1	131	108	97	69	76.9
27	93	27	10	133	100	93	78	79.0
28	96	69	21	147	108	117	69	92.8
29	93	27	76	120	117	89	72	87.9
30	87	54	66	92	100	83	84	83.7
31	96	34	27	101	87	97	66	75.1
32	96	42	76	136	100	109	56	91.0
33	94	42	27	124	75	102	72	79.3
34	94	14	12	101	81	105	66	70.0
35	96	42	12	140	135	97	97	91.6
36	93	79	12	79	138	87	78	83.7
37	93	90	27	127	108	96	81	92.0
38	96	10	14	111	93	99	69	72.8
39	94	42	18	109	115	105	66	81.2
40	94	42	7	138	142	97	76	88.2
41	93	34	50	109	87	99	59	78.6
42	95	42	38	129	66	85	72	78.0
43	94	42	73	92	66	83	56	74.9
44	95	86	46	111	122	97	59	91.1
45	95	73	82	120	81	105	78	93.8
46	95	42	31	81	122	99	66	79.3
47	93	46	82	135	139	105	50	96.2
48	96	21	16	109	63	93	97	73.2

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
49	95	27	54	140	100	114	94	92.3
50	94	62	58	124	70	99	81	87.0
51	94	46	84	124	115	93	81	94.2
52	92	90	27	136	138	97	94	99.7
53	94	34	21	114	100	99	39	74.1
54	90	42	84	117	66	97	66	83.1
55	92	46	50	135	100	91	59	84.8
56	95	14	21	101	132	93	56	75.7
57	92	73	34	81	75	83	53	72.6
58	95	54	31	133	132	97	59	88.9
59	94	69	34	109	108	85	53	81.7
60	88	14	54	75	93	83	92	73.8
61	93	14	38	101	70	83	76	70.3
62	95	54	5	105	146	99	76	85.8
63	96	79	7	111	135	99	69	88.2
64	95	69	50	89	115	81	69	84.0
65	83	62	31	99	127	91	72	83.6
66	92	73	62	135	93	89	84	92.8
67	93	62	34	117	115	85	56	83.1
68	96	73	46	131	100	107	84	94.2
69	93	42	14	109	66	89	62	70.3
70	96	5	1	109	108	93	66	70.7
71	96	46	54	136	87	95	62	85.2
72	87	21	24	120	93	87	69	74.1
73	90	18	50	79	70	91	66	68.6
74	95	34	38	101	100	85	72	77.7
75	95	34	62	133	132	114	62	93.5
76	95	34	69	114	115	102	62	87.4
77	96	86	69	101	87	97	92	92.9
78	94	4	24	105	100	87	56	69.5
79	90	14	34	111	60	89	81	70.9
80	94	42	46	101	128	89	76	85.2
81	96	21	42	117	93	89	73	78.6
82	95	18	42	120	128	97	62	83.1
83	90	69	73	68	60	77	69	74.9
84	95	34	42	150	150	93	59	92.2
85	95	21	31	140	87	99	56	78.3
86	85	4	12	117	87	102	56	68.5
87	96	42	18	114	87	107	62	77.8
88	94	18	62	138	115	95	78	88.8
89	96	18	46	105	81	83	72	74.1
90	93	46	54	75	128	83	88	83.9
91	91	46	62	114	87	91	59	81.4
92	95	42	46	143	139	97	72	93.8
93	93	69	12	111	81	91	72	78.3
94	94	18	50	86	115	97	84	80.5
95	95	46	34	96	122	87	76	82.2
96	94	34	90	129	122	99	100	98.8
97	96	21	46	92	115	114	72	82.2
98	91	73	10	79	87	91	72	74.4

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
99	96	46	36	147	100	105	76	89.6
100	95	62	31	142	132	97	100	97.5
101	96	42	12	105	87	89	59	72.5
102	96	34	54	131	66	117	104	89.1
103	93	46	54	120	108	97	78	88.2
104	96	62	50	127	75	109	69	87.0
105	96	46	12	127	75	95	84	79.1
106	94	79	76	105	81	105	88	92.9
107	94	73	58	150	93	87	76	93.3
108	91	18	34	77	81	87	72	68.0
109	95	18	16	145	108	105	66	81.8
110	96	62	76	129	115	107	84	99.0
111	95	86	34	105	100	97	69	86.7
112	94	27	12	92	81	99	84	72.3
113	92	27	24	150	70	91	84	79.6
114	96	54	21	146	108	114	69	89.9
115	95	18	76	75	122	99	92	85.4
116	96	27	27	86	93	105	72	74.9
117	96	34	79	86	122	107	76	88.8
118	95	54	34	127	70	64	84	78.1
119	94	54	66	92	70	79	69	77.5
120	96	54	1	109	100	114	46	76.9
121	95	18	18	117	115	102	72	79.4
122	94	18	24	92	108	72	72	71.0
123	95	5	58	92	81	97	76	74.6
124	96	46	1	111	108	109	78	81.2
125	96	14	16	120	100	117	78	80.0
126	96	42	46	124	75	97	66	80.8
127	95	46	42	135	115	105	69	89.8
128	94	69	90	101	63	95	100	90.5
129	96	62	66	73	60	102	66	77.7
130	95	34	38	146	147	93	72	92.5
131	78	62	21	92	100	85	59	73.5
132	96	42	69	79	60	85	56	72.0
133	96	62	92	150	115	112	88	105.8
134	94	34	12	81	100	97	66	71.6
135	95	46	50	114	115	97	69	86.7
136	93	18	38	135	81	77	69	75.6
137	96	79	42	124	132	89	94	97.0
138	94	54	31	135	75	83	76	81.1
139	95	18	2	145	128	83	53	77.5
140	93	54	66	131	87	87	78	88.2
141	96	79	21	129	100	93	81	88.6
142	91	73	54	131	93	89	88	91.6
143	91	86	46	136	100	93	78	93.2
144	94	62	42	101	122	99	72	87.6
145	93	46	5	83	122	102	92	80.3
146	96	97	54	83	108	97	72	89.8
147	94	46	27	86	75	97	66	72.6
148	92	46	2	101	75	99	69	71.6

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
149	90	54	31	83	70	75	92	73.2
150	94	42	50	92	63	97	124	83.1
151	96	10	18	124	108	93	94	80.3
152	92	42	54	120	100	81	76	83.6
153	96	54	42	127	100	102	81	89.1
154	95	46	54	96	60	99	72	77.2
155	92	73	24	111	87	97	69	81.8
156	95	42	24	133	122	114	59	87.1
157	96	27	5	129	135	107	69	84.0
158	96	46	12	96	93	109	62	76.0
159	94	79	12	127	75	91	66	80.5
160	95	10	14	96	87	95	76	70.0
161	94	46	38	117	60	93	76	77.5
162	95	27	42	133	138	99	78	90.5
163	96	90	73	114	66	83	76	88.5
164	94	10	54	79	60	89	84	69.5
165	93	10	66	77	60	99	72	70.6
166	94	34	54	86	81	93	72	76.0
167	94	21	69	89	100	102	100	85.1
168	96	21	21	96	81	114	94	77.4
169	95	73	21	136	87	99	43	82.0
170	96	73	12	96	70	112	92	81.5
171	96	86	69	96	122	99	78	95.6
172	94	90	54	101	75	79	76	84.2
173	96	76	73	131	122	102	81	100.7
174	96	46	12	75	70	97	66	68.3
175	95	69	16	150	135	109	66	94.7
176	96	73	58	96	108	102	100	93.6
177	95	18	12	117	87	89	128	80.8
178	92	10	34	101	87	97	92	75.9
179	94	62	14	139	108	99	88	89.3
180	96	18	14	117	93	102	69	75.3
181	96	34	46	150	128	112	113	100.4
182	96	86	14	143	122	109	56	92.6
183	95	86	27	124	81	99	84	88.2
184	96	27	58	77	135	85	97	85.1
185	96	54	42	89	87	95	78	80.0
186	95	86	98	77	75	99	88	91.4
187	96	90	62	111	122	121	94	103.0
188	96	66	69	129	122	102	106	102.1
189	96	10	16	143	132	85	78	82.8
190	94	46	38	92	66	79	50	68.8
191	95	42	18	142	122	102	59	85.8
192	95	27	42	86	138	107	56	81.5
193	96	12	14	117	122	97	76	79.0
194	96	31	76	92	81	119	88	86.2
195	96	34	24	150	81	93	50	78.1
196	96	27	46	96	100	91	43	73.8
197	94	18	5	117	115	93	56	76.7
198	96	62	66	92	66	95	88	83.6

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
199	96	34	12	131	100	97	36	74.9
200	96	90	54	131	122	105	76	99.7
201	94	95	21	96	93	87	81	83.9
202	95	90	34	89	108	87	66	84.2
203	95	14	10	101	70	105	66	68.2
204	94	27	27	117	77	87	78	75.0
205	96	34	42	96	63	109	92	78.7
206	95	42	54	127	60	93	81	81.7
207	95	21	21	96	63	91	78	68.8
208	93	21	18	83	81	107	88	72.6
209	96	21	46	109	60	85	84	74.1
210	93	62	21	92	81	99	92	79.9
211	93	27	16	89	60	97	92	70.1
212	95	27	7	120	60	83	84	70.4
213	94	54	4	109	70	87	113	78.6
214	93	62	54	89	63	109	69	79.7
215	93	21	46	105	63	85	92	74.7
216	94	34	21	117	60	81	78	71.7
217	87	46	76	77	60	109	76	78.6
218	96	38	46	86	70	87	72	73.2
219	92	21	73	148	81	95	66	85.2
220	95	42	88	109	60	87	88	84.2
221	94	54	42	105	60	62	50	69.1
222	95	21	76	109	70	93	81	80.6
223	94	21	46	73	60	99	81	70.1
224	96	46	84	120	93	87	94	91.7
225	90	46	10	114	60	72	76	69.2
226	96	62	24	135	93	93	59	83.1
227	96	79	34	109	70	95	76	82.1
228	91	46	27	139	81	102	88	84.9
229	93	46	50	86	66	93	59	72.9
230	92	42	69	86	60	91	66	74.9
231	89	54	92	138	60	54	66	81.8
232	95	27	34	89	75	109	94	77.4
233	96	27	54	124	70	105	92	84.0
234	94	42	62	83	60	89	88	76.6
235	94	16	76	81	70	89	76	74.3
236	92	62	38	133	70	93	59	80.9
237	96	62	34	109	60	99	76	79.3
238	95	73	8	131	66	102	56	78.6
239	95	27	18	136	60	97	81	76.0
240	93	5	50	105	66	95	69	71.4
241	92	54	27	96	60	91	72	72.8
242	96	34	76	138	81	105	88	91.4
243	94	34	64	136	63	89	104	86.4
244	81	62	24	120	60	62	78	72.0
245	95	42	42	150	70	99	53	81.5
246	91	34	90	114	63	81	53	77.8
247	58	42	66	124	60	107	62	76.8
248	95	21	18	111	60	95	84	71.6

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
249	94	4	34	109	66	107	84	73.7
250	93	27	16	92	81	93	81	71.4
251	90	46	31	81	81	77	84	72.5
252	89	46	50	83	75	79	72	73.1
253	93	86	38	71	63	57	56	68.6
254	96	27	12	127	63	91	76	72.8
255	82	54	42	92	60	67	88	71.7
256	96	42	54	101	75	95	92	82.1
257	93	86	84	146	70	95	88	97.9
258	94	10	27	117	63	95	72	70.7
259	92	18	54	117	63	85	81	75.4
260	88	54	88	101	63	85	84	83.3
261	94	27	54	105	70	97	84	78.6
262	92	73	62	101	60	89	78	82.1
263	94	14	42	131	70	102	59	75.7
264	96	79	42	111	60	97	72	82.4
265	90	46	31	81	70	93	84	73.2
266	96	42	31	138	66	107	53	78.8
267	93	21	27	124	81	97	94	79.4
268	92	54	50	127	70	87	76	82.2
269	96	34	27	111	66	107	81	77.2
270	93	79	34	86	60	93	76	77.1
271	94	18	58	127	60	97	66	76.9
272	95	18	42	92	63	87	69	68.9
273	95	14	58	92	60	81	88	72.2
274	91	21	54	105	81	93	84	78.3
275	94	42	79	129	75	97	76	87.6
276	91	62	5	81	81	81	76	70.6
277	96	46	99	148	75	109	100	99.6
278	92	21	10	117	60	105	62	69.1
279	94	42	54	81	93	97	72	78.8
280	96	69	82	105	70	102	81	89.5
281	94	90	73	129	75	81	92	93.8
282	94	42	69	124	75	97	88	87.1
283	95	42	31	131	60	102	100	83.0
284	94	54	69	73	75	95	81	80.0
285	94	46	58	129	81	95	94	88.3
286	95	18	58	86	66	99	84	74.9
287	96	73	1	135	66	79	97	80.9
288	95	46	50	109	66	102	97	83.6
289	95	42	50	96	81	93	92	81.2
290	93	5	21	111	87	105	88	75.4
291	94	79	58	111	66	95	78	85.9
292	94	62	86	145	75	87	30	85.7
293	96	54	42	139	75	109	84	88.6
294	95	42	69	92	60	89	106	81.8
295	93	46	76	140	100	75	88	91.4
296	92	46	62	77	60	87	62	71.9
297	91	54	14	140	75	97	59	78.4
298	93	73	46	89	60	102	76	79.7

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	Total
299	94	27	24	83	60	107	78	70.0
300	93	69	62	114	70	64	59	78.6
301	96	46	49	92	60	96	78	76.5
302	95	18	27	109	66	93	53	68.2
303	92	27	54	96	66	77	92	74.6
304	96	54	31	150	81	81	76	84.2
305	94	86	54	129	66	91	113	93.6
306	95	79	69	142	87	99	62	93.6
307	92	10	27	101	75	105	50	68.0
308	92	42	24	111	60	97	66	72.8
309	96	18	24	120	60	107	81	74.9
310	94	34	50	92	70	99	69	75.1
311	94	46	27	117	70	102	62	76.6
312	95	54	24	96	60	95	84	75.1
313	93	54	61	147	66	97	72	87.3
314	95	54	21	127	66	97	88	81.1
315	95	34	12	109	63	83	81	70.6
316	96	46	14	140	70	91	50	75.0
317	93	34	73	117	66	91	69	80.3
318	93	62	76	138	81	93	97	94.7
319	96	27	27	117	75	95	88	77.7
320	91	14	14	117	63	93	104	73.4

Appendix C: Learning Disabled Raw Scores in Nine Tests

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	PgL	VM	Total
1	94	1	2	81	60	91	50	24	88	54.8
2	61	4	2	127	60	83	56	32	84	56.8
3	94	34	5	81	66	83	88	59	63	64.0
4	91	42	54	92	83	75	14	59	106	68.8
5	93	10	27	96	60	91	50	59	125	68.2
6	82	5	14	81	70	83	59	34	107	60.0
7	94	21	18	96	60	93	62	34	88	63.2
8	91	5	21	92	60	95	84	41	81	63.6
9	85	34	24	66	60	64	78	24	62	55.5
10	79	1	3	66	60	77	59	30	81	50.9
11	92	18	12	83	77	95	46	41	95	62.4
12	91	1	8	105	60	67	57	24	101	57.4
13	93	14	1	75	75	102	62	53	88	62.8
14	92	42	16	77	60	89	76	53	149	73.0
15	91	18	21	75	60	67	46	51	96	58.6
16	92	18	18	114	60	93	53	49	106	67.3
17	96	34	21	81	60	91	46	59	93	64.8
18	88	21	46	92	60	75	76	59	71	65.6
19	91	27	21	86	60	81	56	65	92	64.6
20	94	1	8	117	60	97	72	24	118	66.0
21	93	34	16	79	60	62	76	53	58	59.3
22	94	18	5	81	63	93	59	51	140	67.4
23	94	14	5	109	66	77	69	51	86	63.7
24	85	14	4	89	60	77	66	51	83	59.0
25	91	10	1	86	60	83	69	32	88	58.0
26	95	27	14	79	66	95	53	59	150	71.2
27	94	27	27	81	60	81	66	53	141	70.3
28	90	10	27	77	60	85	76	41	83	61.3
29	82	27	1	96	60	67	69	65	84	61.5
30	92	14	12	77	60	81	53	34	88	57.0
31	93	10	14	101	66	79	62	62	109	66.5
32	86	5	14	117	60	99	59	20	76	59.8
33	96	21	12	120	60	77	59	41	99	65.3
34	87	34	24	73	60	64	66	59	106	64.0
35	92	21	42	89	75	77	56	91	132	75.3
36	88	18	10	105	60	81	56	30	132	64.7
37	93	5	1	129	81	91	59	41	119	69.1
38	90	27	12	81	66	69	59	78	131	68.4
39	94	21	42	92	60	77	72	41	101	67.0
40	66	18	34	81	60	62	69	49	111	61.4
41	95	5	3	73	60	67	62	45	101	57.0
42	88	18	1	77	60	91	84	49	117	65.3
43	91	4	4	83	60	85	56	72	106	62.6
44	94	14	18	81	60	81	88	49	79	62.9
45	91	42	8	77	60	72	76	43	93	62.7
46	91	18	5	68	60	81	53	41	84	55.9
47	94	5	8	92	81	102	59	91	117	72.4
48	95	18	24	101	60	91	62	45	121	68.9

No.	Disc	Spa	Flex	Voc	Comp	Spell	Arith	PgL	VM	Total
49	93	10	31	111	70	83	59	59	99	68.6
50	95	14	14	86	70	87	81	41	83	63.7
51	95	10	10	89	60	77	39	51	94	58.6
52	91	14	1	86	60	77	76	59	102	63.2
53	86	2	1	75	60	91	69	37	66	54.4
54	95	46	5	92	60	83	59	65	70	64.2
55	95	21	12	77	60	89	81	45	92	63.8

Legend:

Disc - Test of Word Discrimination
Cognition: Word Recognition
Spa - Test of Closure Speed
Processing: Visual Spatial
Flex - Test of Closure Flexibility
Processing: Visual Figure-Ground
Voc - Test of Vocabulary
Cognition: Vocabulary
Comp - Test of Comprehension
Cognition: Comprehension
Spell - Test of Spelling
Cognition: Spelling
Arith - Test of Arithmetic
Cognition: Arithmetic
PgL - Test of Paragraph Listening
Cognition used as an indicator of auditory processing
VM - Test of Visual-Motor
Processing: Graphomotor